WHAT IS CLAIMED IS:

1. A bi-directional cutting saw of the type for use in singulation of substrates and dicing of wafers, comprising:

first and second linear transport means arranged parallel to each other;

each said transport means comprising a linear actuator and a carrier support moveable by said linear actuator;

means for positioning each said carrier support sequentially from a load/unload station to a vision position station and then to a singulation cutting station;

each said carrier support being reciprocally moveable back and forth in an X-axis direction at said singulation/cutting station;

singulation/cutting means for separating semiconductor type substrates/wafer devices one from another while mounted on said carrier support by cutting the substrate/wafer as it passes in both X directions; and

simultaneously cutting a first substrate/wafer on a carrier support on a first linear transport means while simultaneously loading and positioning a second substrate/wafer on a second carrier support ready for cutting on a second linear transport means, thereby reducing lost cutting time to a minimum.

2. A bi-directional cutting saw as set forth in claim 1 wherein said substrate/wafer is a rectangular strip and said carrier support is adapted to receive an adapter plate and a gasket for supporting said strip on said carrier support.

3. A bi-directional cutting saw as set forth in claim 2 wherein said carrier support comprises means for rotating said strip exactly 90 degrees from a predetermined position.

4. A bi-directional cutting saw as set forth in claim 1 wherein said carrier support comprises means for vertically positioning a substrate/wafer.

5. A bi-directional cutting saw as set forth in claim 1 wherein said singulation cutting means comprising blade support means, and

a pair of counter-rotating saw blades mounted on said blade support means for vertical movement and for engaging one of said saw blades into engagement with a substrate/wafer when moved in a first X direction and for engagement with the other said saw blades when moved in a direction opposite to said first X direction.

6. A bi-directional cutting saw as set forth in claim 5 wherein said blade support means comprises a rocking frame mounted on a pivot shaft.

7. A bi-directional cutting saw as set forth in claim 6 wherein said pivot shaft is moveable in a clockwise and/or a counter-clockwise position to position one of said saw blades in a downward Z direction.

8. A bi-directional saw for singulating semiconductor devices from a substrate, comprising:

a pair of counter-rotating saw blades mounted on a moveable frame positioned above a substrate to be singulated,

transport means mounted on a base below said saw blades for moving substrates to be singulated into engagement with one or the other of said saw blades,

said transport means having front and rear linear actuators arranged parallel to each other,

a front substrate carrier support coupled to said front linear actuator,

a rear substrate carrier support coupled to said rear linear actuator,

one of said substrate carrier supports being moveable transversely from a load and unload station to a vision positioning station while the other of said carrier supports is being reciprocally moved into engagement with one and then the other of said pair of counter-rotating saw blades.

9. A bi-directional saw as set forth in claim 8 which further includes means for vertically moving downward one of said saw blades into engagement with a substrate to be sawn while simultaneously vertically raising the other of said saw blades.

10. A bi-directional saw as set forth in claim 9 wherein the moveable frame on which the pair of counter-rotating saw blades are mounted is supported on a pivot shaft, and

means for pivoting said frame on said pivot shaft to move one saw blade downward while simultaneously moving the other of said saw blades upward.

11. A bi-directional saw as set forth in claim 10 wherein said pivot shaft is mounted on and supported by a Y-axis gantry for supporting said saw blades in a Y-axis relative to a substrate on a substrate carrier support prior to sawing the substrate.

12. The method for bi-directionally sawing a substrate, comprising the steps of:

providing a singulation saw with a plurality of rotating saw blades for sawing a substrate to separate individual devices one from the other,

rotating one saw blade in a clockwise direction and the other saw blade in a counter-clockwise direction,

moving the substrate into engagement with one of the saw blades while moving in a first direction,

reversing the movement of the direction of the substrate and engaging the other of said saw blades into engagement with the substrate, and

sawing the substrate using the different saw blades while sawing in opposite directions.

13. The method as set forth in claim 12 wherein the step of providing a singulation saw further includes mounting said rotating saw blades on a pivoting frame,

moving the clockwise rotating saw blade into engagement with the substrate by pivoting the frame, and

simultaneously moving the counter-clockwise rotating saw blade clear of engagement with the substrate.

14. The method as set forth in claim 12 wherein the step of moving the substrate into engagement with one of the saw blades comprises plunging the cutting edge of the saw blade vertically into the edge of the substrate to be cut to start a new saw cut and moving the substrate horizontally to complete the saw cut.

15. The method as set forth in claim 12 wherein the step of moving the substrate into engagement with one of the saw blades comprises raising the saw blade from the saw cut as soon as the saw blade finishes the saw cut in a reverse of a plunge cut while the cutting edge of the saw blade is in the saw cut.

16. The method as set forth in claim 13 wherein the steps of moving the substrate and reversing the movement of the substrate comprises positioning of two saw cutting blades over the edge of a substrate to be cut and removing the saw blade vertically as soon as the blade finishes a saw cut, then repeating the cutting sequence with the other saw blade while moving the substrate in the opposition direction.

17. A system for singulating substrates or wafers, comprising:

a first moveable substrate carrier mounted on a first linear actuator,

a second moveable substrate carrier mounted on a second linear actuator,

means for independently controlling the theta or Z-motion of each of said substrate carriers,

means for independently controlling the X-position of said substrate carrier on its linear actuator,

said means for controlling the X-position of said substrate carriers comprising means for reciprocally moving one of said substrate carriers in a cutting station under a pair of saw blades mounted in the same cutting plane, and

simultaneously positioning the other of said substrate carriers at an unload and loading station, then

to a vision positioning station and then to a position outside of said cutting station ready to enter the cutting station when the substrate carrier in the cutting station moves out of the cutting station, thereby virtually eliminating any loss of cutting time.

18. A system as set forth in claim 17 wherein said first and second linear actuators are parallel to each other and said substrate carriers are so large that they will not pass each other in a Y-axis direction, and

means for positioning the substrate carrier or wafer carrier in a theta and/or Z-direction so that the carriers do not occupy the same space at the same time when passing each other in the X-axis direction when moving from one station to another.